

Cardiac rehabilitation effects on quality of life in patients after acute myocardial infarction

Antonakoudis H, Kifnidis K, Andreadis A, Fluda E, Konti Z, Papagianis N, Stamou H, Anastasopoulou E, Antonakoudis G, Poulimenos L

Department of Cardiology, Asclepeion Hospital, Athens, Greece

Abstract

Aim of this study was to investigate the significance of cardiac rehabilitation (CR) on Health Related Quality of Life (HRQoL) in post acute myocardial infarction (AMI) patients. Methods. A total number of 110 individuals divided in 3 groups was included in the study. Group A consisted of 60 post-AMI pts participating in a CR program. It was a multidisciplinary rehabilitative approach including supervised bike exercise, with parallel education, counselling, psychological and social support, performed 3 times per week for 2 months after AMI. Group B consisted of 40 post-AMI pts not participating in any CR program while the control group C consisted of 10 apparently healthy people. HRQoL was evaluated by the Velasco-Del Barrio questionnaire. Questions on this questionnaire are referred to 9 categories (health, sleep and rest, emotional behavior, concerns for the future, mobility, social interaction, alertness behavior, communication, work and leisure time). A 5-point scale (1=all of the time, 5=none of the time) and a special (1 to 8) coefficient for each parameter were used for the evaluation of each parameter. The highest score of 220 indicates the poorest QL. Results. Group A pts had better score of HRQoL as compared to Group B (94 ± 3 vs 114 ± 3 , $p<0.001$) and slightly worse than Group C pts (94 ± 4 vs 69 ± 3 , $p<0.01$). Significant difference was found among Group A and B pts regarding the most important evaluated parameters such as symptoms (17 ± 6.8 vs 22 ± 6.5 , $p<0.001$) and social behavior (21 ± 4.2 vs 23 ± 5.5 , $p<0.0001$). Conclusion. It is concluded that participation in a multidisciplinary CR program significantly improves HRQoL in post AMI pts. All these pts must be urged to take part in such programs. *Hippokratia 2006; 10 (4): 176-181*

Key words: *Quality of life, acute myocardial infarction, cardiac rehabilitation*

Corresponding author: Antonakoudis H, 14 Ag Ioannou Str, 163 41, Athens, Greece, Tel 30 210 9921975, e-mail antonakoud@yahoo.gr

Introduction

Coronary heart disease (CHD) is still the leading cause of death in the industrialized world while in parallel it is one of the most common causes of long-term disability. Important advances in the treatment of acute CHD, such as beta-blockade, thrombolytic treatment and interventional therapy have increased survival rates by 50%. Many of these individuals with CHD have difficulties in resuming a reasonably normal active life including return to work and participation in social and recreational activities. These difficulties result in a poorer HRQoL for the cardiac patient. Nowadays it is documented that participation in CR has a positive effect on HRQoL¹⁻³.

Cardiac rehabilitation aspects. CR has been defined as the sum of interventions required to ensure the best possible physical, psychological and social conditions so that patients with subacute or chronic heart disease may, by their own efforts, preserve or resume a place in the life of the community. Cardiac rehabilitation can

have a significant positive effect on health and HRQoL and the current challenge is to deliver this multidisciplinary rehabilitative approach to all cardiac patients.

The definition of cardiac rehabilitation implies a clear need for a multidisciplinary approach over a long time period. CR is therefore divided, by the World Health Organization classification, into three phases: the acute phase (in-hospital), the reconditioning phase (1-3 months after the acute episode) and the maintenance phase (along all life). The reconditioning phase (phase II), includes exercise training, risk factor modification, education, counseling, smoking cessation strategies and, if necessary, individual psychological treatment. The cardiovascular rehabilitation team is typically composed of a physician, an exercise physiologist, an exercise therapist or physiotherapist, a psychologist or social worker or other qualified mental health professional, a dietician and a nurse.

Documented benefits of cardiac rehabilitation are improved cardiovascular capacity, improved mood and

prevention of psychological complications, return to productive normal social life, modification of risk factors and secondary preventive effects. Cardiac rehabilitation has also been associated with reduced demand for health services and fewer clinical events⁴⁻⁹.

Quality of life aspects. CAD, like any other chronic disease, affects not only the physical performance but the psychological and social behavior of these patients as well. So, all these parameters have to be considered when treating these patients. HRQoL is a very important parameter to which we must focus when we as cardiologists treat CAD pts. In the developing countries the number of patients surviving an AMI has increased. Many AMI survivors have significant physical, psychological and social disabilities. As these pts become older and more isolated and as their condition deteriorates they become more depressed. Many approaches can improve the HRQoL for these pts such as reduction of number of cardiac events and hospitalization, the support of the family, the increased physical and leisure activity. All of these improve the psychological stability and increase their self-confidence. Measuring HRQoL after interventions such as a cardiac rehabilitation is therefore very important but it is not systematically evaluated¹⁰.

The HRQoL has been defined as the sum of satisfactions that make life worthy or as the individual's ability to function and derive satisfaction from a variety of roles on daily life. The use of comprehensive questionnaires has now spilled over into cardiology topics such as CAD, heart failure, interventional cardiology etc. A variety of instruments is today available for HRQoL estimation: the Sickness Impact Profile (SIP), the McMaster Health Index Questionnaire, the Nottingham Health Profile, the Quality of Well - being Scale, the Seattle Angina Questionnaire, the SF - 36, the Minnesota Living with Heart Failure. In South Europe countries the Velasco-Del Barrio questionnaire has been used. Any questionnaire in cardiac pts would have to take into account the type of cardiovascular disease. It has to be emphasized that in cardiac pts some questions, especially as regard sexual activity, are very sensitive and sometimes the evaluation from physicians, patients or other family members are different¹¹⁻¹⁸.

The HRQoL has three major components¹³:

1. *Functional capacity*: activities of daily life, job satisfaction, family interactions, sexual activity, social function, intellectual function, emotional function, economic status, mobility, independence, self - care, sleep and rest, occupational and recreational activities, etc.

2. *Perceptions of*: health status, well - being, satisfaction, communication, mood changes, anxiety, anger depression, helplessness, concerns for the future, etc.

3. *Symptoms*: dyspnea, fatigue, pain, recurrent cardiac events, recurrent hospitalizations, amount and types of medication, side-effects of medication, etc.

In this prospective study we investigate the significance of participation in a RP of post AMI pts on HRQoL

improvement. The Velasco-Del Barrio questionnaire has been used for HRQoL evaluation. This questionnaire was preferred because it has been previously used in mediterranean populations¹³.

Patients and methods

A total number of 110 individuals took part in the study. From a serie of 100 consecutive pts with AMI 60 pts took part in a CR program for 2 months after hospital discharge (Group A) while 40 pts didn't took part in any RP (Group B). The usual advices for healthy lifestyle were given to Group B pts. Not any randomization was done but pts living far from our hospital (who for this reason couldn't participate and so a low compliance was expected) included in Group B. A group of 10 apparently healthy individuals with similar age, without any risk factors consisted a third control group-Group C.

Group A pts took part in a RP for 2 months after hospital discharge (intermediate or reconditioning phase of any rehabilitation programs). A symptom limited low intensity bike (10 watts per min) stress test was performed in all these pts one week after discharge. The maximal perceived workload was used as a criterion for exercise intensity prescription followed by each one patient. After that pts took part in a RP for 2 months. The program included supervised in-hospital bike exercise 3 times per week for 30 min. During every exercise session a 5 min interruption for 2 min was done for safety reasons and in order to measure blood pressure and heart rate. Furthermore during any exercise session education and counseling was performed for at least 20 minutes. Counseling regarding coronary heart disease, myocardial infarction, their present health situation, disease evolution, risk factors, diet, cardiac symptoms recognition, future expectations took place. Aim of this education and counseling was the psychological support. The spouse of other family members involved in this counseling session when it was needed. Details regarding sexual activity, return to work and vocational details were also discussed.

In group B pts the usual advice was given to all pts at hospital discharge with emphasis on diet, regular exercise and risk factor modification. After 2 months all Group A and B pts return to the hospital. A maximal treadmill stress test was performed using Bruce protocol. From all exercise parameters the exercise duration, maximal ST depression, maximal heart rate achieved, blood pressure and double product were evaluated. In the same visit the QoL was evaluated based on Velasco - Del Barrio questionnaire. In this questionnaire the questions given are divided in 9 categories¹³:

1. *Health* (8 items), e.g. chest pain, fatigue, tiredness, missing smoking, etc.

2. *Sleep and rest* (3 items), e.g. "I can't sleep"

3. *Emotional behavior* (3 items). e.g. "I am excited", etc.

4. *Concerns for the future* (3 items), e.g. "I think I am going to die soon", "I fell helpless" etc.

5. *Mobility* (5 items), e.g. "I don't like leaving home",

“I don’t like walk “ etc.

6. *Social interaction* (7 items) e.g. “I go out less now to visit friends”, “I like to be alone”, “My sex life is not as good as it was”, etc.

7. *Alertness behavior* (3 items), e.g. “My short - term memory is impaired” - “I react very slowly”, etc.

8. *Communication* (3 items), e.g. “I have to make an effort to maintain conversation”, “I do not like using the telephone”, etc.

9. *Work and leisure time* (5 items), e.g. “I work less now than I did before”, “I do not like my job”, etc.

Table 1. Paradigm of QoL evaluation in 1 person of each group

Parameter	Co-efficient	Graduation			Totally		
		Group A	Group B	Group C	A	B	C
1	8	2	3	2	16	24	13
2	3	1	1	1	3	3	3
3	3	1	2	2	3	6	6
4	3	1	2	1	3	6	3
5	5	1	2	1	5	10	5
6	7	3	4	2	21	28	14
7	3	2	2	1	6	6	3
8	3	1	2	1	3	6	3
9	5	2	4	2	10	20	10
					x 75	106	63

The following 5 - point Likert-type scale was selected where 1=all of the time, 2=most of the time, 3=some of the time, 4=a little of the time and 5=none of the time. Each one parameter is validated and multiplied according its significance and importance. The highest score of 220 would indicate the poorest quality of life; a low score would indicate a good quality of life. On Table 1 an example of graduation in each one parameter and totally as well in one patient of each one group is shown.

Results

The basic clinical characteristics of all studied pts are shown on Table 2. As it is seen in this table there were not essential differences between group A and B pts as regard age, body weight, coronary risk factors such as cholesterol, smoking habits, hypertension, diabetes mellitus.

Table 2. Basic clinical characteristics of group A and B patients

	Group A	Group B
Age (years)	48.2±1.2	46.9±0.8
Weight (kg)	82±2	86±3
Cholesterol (mg/dl)	234±62	218±54
HDL (mg/dl)	44±11	47±10
Smokers (%)	74%	70%
Diabetics (%)	15%	15%
SBP mmHg	125±0.8	130±1.0
DBP mmHg	88±0.4	90±0.3

A maximal treadmill stress test was performed in all pts of Group A and B at the end of the study. Group A pts had better exercise time (410±30 vs 326±20 sec, p<0.05). However there was not any significant difference among 2 groups regarding the maximal ST depression (0.16±0.03 vs 0.18±0.04 mV, p: NS), maximal achieved heart rate (160±28 vs 169±23 beats per minute, p: NS), maximal systolic blood pressure (157±14 vs 165±12 mmHg, p: NS) and double product as well (25.1 x10³ vs 27.8X10³, p: NS). The stress test was performed while the patients were on appropriate therapy. All pts were receiving b-blockers, aspirin and nitros. In some of them additional treatment with calcium antagonists, angiotensin converting enzyme inhibitors or other drugs was given.

The main scope of the study was to evaluate QoL and investigate any differences among groups in order to conclude if CR has any beneficial effect. On Table 3 the total score of QoL in each of 3 studied groups and among them comparison is shown. Lower score indicates better quality of life. The QoL score was 94±4 for group A, 114±3 for group B and 69±3 for group C. As it is was expected QoL was better in group C pts both as compared to group A (69±3 vs 94±4, p<0.01) and group B (69±3 vs 114±3, p<0.001) as well. But the important finding of our study is the significant difference founded between group A and B pts. Patients participating in the RP had better QoL score when compared to patients not participating (94±4 vs 114±3, p<0.01). This difference indicates the beneficial effect of RP on the QoL of post infarct patients.

Table 3. Total quality of life score and within 3 groups comparison

GROUP A	94±4	GROUP B	114±3	GROUP A	94±4
GROUP C	69±3	GROUP C	69±3	GROUP B	114±3
p: < 0.1		p: < 0.001		p: < 0.01	

Finally the Table 4 shows the values of each one parameter in each one group in parallel with statistical analysis among the 3 group (A to C, A to B, B to C). It is interesting to analyze the differences observed among the group A and B, because this difference indicates the effect of rehabilitation on QoL. As it is shown on this table in 5 parameters there was not significant difference among the 2 groups. Differences detected as regard sleep (4.7±2.3 vs 4.7±2.3, p: NS), emotional behavior (4.7±2.3 vs 6.8±1.7, p: NS), concerns for the future (4.7±2.3 vs 5.8±1.7, p: NS), mobility (7.5±4.7 vs 10±4.4, p: NS) and alertness behavior (4.7±2.3 vs 4.7±2.3, p: NS) were not significant. Significant differences were detected between groups A and B in some of the most important questions. Significant difference was detected regarding health or symptoms relative questions (17±6.8 vs 22±6.5, p<0.001), social interaction (21±4.2 vs 23.2±5.5, p<0.001), work and leisure time (18±4.4 vs 20±4.7, p<0.0001) and mobility (7.5±4.7 vs 10±4.4,

$p < 0.001$). Significant differences were also detected in all test parameters such as emotional behavior (4.7 ± 2.3 vs 6.8 ± 1.7 , $p < 0.001$), concerns for the future (4.7 ± 2.3 vs 5.8 ± 1.7 , $p < 0.001$), and communication as well (12 ± 6.8 vs 16.8 ± 1.7 , $p < 0.0001$).

As it was already mentioned the RP consisted of 30 min supervised bike exercise with parallel education, counseling and psychological support. The questionnaires were administered by a trained interviewer. The interview lasted approximately 45 min and the interviewer tried to evaluate the reaction of the patients during the administration of the questionnaires. At the end of the study a maximal treadmill stress was performed. Group A pts had better physical performance as it is concluded from exercise duration in this stress test. It is reasonable to suppose that any QoL improvement may due to this better physical performance. Unfortunately, due to limited number of study population such investigation was not done.

Table 4. Evaluation and Comparison of 9 parameters among 3 groups

Parameter	VALUES			COMPARISONS		
	Group A	Group B	Group C	A - C	A - B	B - C
1	17±6.8	22±6.5	16±4.2	$p < 0.001$	$p < 0.001$	$p < 0.001$
2	4.7±2.3	4.7±2.3	4.2±2.1	NS	NS	NS
3	4.7±2.3	6.8±1.7	5.4±1.9	0.001	NS	NS
4	4.7±2.3	5.8±1.7	5.4±1.9	0.001	NS	NS
5	7.5±4.7	10±4.4	6.3±3.2	0.001	NS	0.001
6	21±4.2	23.2±5.5	18±3.8	0.001	0.001	0.0001
7	4.7±2.3	4.7±2.3	3.2±4.2	NS	NS	0.0001
8	17±6.8	16.8±1.7	4.2±2.1	0.0001	0.0001	0.01
9	13±4.4	20±4.7	6.3±2.2	0.0001	0.001	0.0001

Statistical Analysis

The student t-test was used to compare differences for each of all parameters and for total score among groups as well.

Discussion

Traditional aim of treatment of coronary artery disease is to improve prognosis by the best evidence based pharmaceutical and interventional therapy. Cardiac rehabilitation is another tool that has both short-and long-term goals. A major goal is to achieve the highest level of QoL. The QoL, a relatively new scientific measure, is strongly influenced in CAD patients especially soon after an acute myocardial infarction, acute coronary syndrome or heart failure. Cardiac rehabilitation interventions have been proven to increase QoL. Many studies have proved the beneficial effects of exercise, education, counseling, psychological support. It is estimated that over 20% of cardiac patients demonstrate levels of anxiety or depression which continue for up to a year after the acute event and require explicit professional intervention. Cardiac rehabilitation interventions reduce patient anxiety and depression, increase quality of life.

Psychological intervention can directly assist patient outcome by improving quality of life. Successful rehabilitation restores a patient not only to optimal physical, mental, social, vocational and economic usefulness but also to pre - illness sexuality - a normal part of a lifelong phenomenon¹⁹⁻²⁵.

In this prospective non randomized trial a group of 100 consecutive past AMI pts took part, while a group of 10 apparently healthy individuals served as a control group. Study population of the 100 post AMI pts divided in 2 groups A and B. Group A pts took part in supervised RP including bike exercise, education, counseling and psychological support. Education and counseling considered as an important part of our RP because some post-AMI pts show a bad compliance to their physician's recommendation while on the other hand some other pts have a negative psychological affect.

It is worthy to mention that the compliance of pts in RP participation was excellent. Group A patients had a better physical performance. It was expected there is no doubt that exercise training has a positive effect on exercise tolerance. This improves symptoms and in some degree the psychological status as well²⁶⁻²⁸.

The rationale for assessing and improving HRQoL is important²⁹⁻³² and in this study the QoL was investigated at the end of the study. The results of this analysis focused both in total score and some of very important parameters.

In our study Group A pts had a better HRQoL score as compared to Group B patients (94 ± 4 vs 114 ± 3 , $p < 0.01$). This score was closed but obviously worse to HRQoL score of control group (94 ± 4 vs 69 ± 3 , $p < 0.01$). The positive effects must be considered mainly as an effect of participation in RP and especially to education, counseling and psychological support.

It is important to emphasize differences observed among 2 groups as regard each one parameter of questionnaire used. The results on HRQL evaluation showed a significant difference in symptoms. This difference is mainly a benefit gained by exercise. Not significant differences were found between groups A and B as regard parameters such as sleep and rest, emotional behavior, concerns for the future, and mobility as well. But ,beyond the difference in symptoms, significant differences were observed in many other parameters. So a significant difference was observed among 2 groups in social interaction where sexual life is included. Rehabilitation of the patients with coronary heart disease should include consideration of sexual activity, as sexual activity is an important part of life. Fear of resumption of sexual activity may occur in 30 - 50% of patients and in a higher percentage of spouses. Coital death occurs in less than 1% of cases of sudden death, most commonly with a new partner, usually extramarital. Even in the extramarital situation the risk of cardiac problems is small. Accurate data on coital deaths are difficult to obtain, since the surviving partner may disappear and, in marital situations, the spouse may be hesitant to

report the real circumstances. The quality of family life and marriage are markedly associated with sexual satisfaction and appear to be important determinants of the physiologic and social outcome of the patient. Resumption of sexual activity leads to a better emotional relationship of the couple after myocardial infarction. The spouse plays a major role in the patient's coping and readjustment and, therefore, attention to the spouse's sexual concerns and needs is vital. The goal of counseling is to provide patients with the information they need to make decisions. Attention to the sexual concerns and needs of the coronary patient as well as the spouse is vital for comprehensive rehabilitation. The spouse and patient sometimes share concerns that the course of coronary disease may be accelerated by the resumption of sexual relations. Both have fears and anxieties about resuming sexual activity. Separate counseling provides each partner of the couple with an opportunity to express personal concerns, and joint sessions reinforce information given earlier^{21,25,27,32}.

Communication and work / leisure parameters were also positively affected. This effect is worthy to mention as it is an important component of QoL³³. All post AMI patients have to participate in CR programs including group or team intervention. This approach increases the patient's confidence and well-being feeling. The social position of the patients is a very important parameter that must be taken in mind when organizing a multidisciplinary program.

In conclusion results of our study indicate that participation in a multidisciplinary RP is strongly beneficial. Compliance of patient's seems to be excellent. The quality of life of post AMI pts is impaired. In our selected group of patients participating in a RP we registered a HRQoL that was better in comparison to HRQoL of patients not participating and it was almost similar to controls. These results are in agreement to other studies which have shown the positive effects of cardiac rehabilitation on HRQoL. All post AMI pts must be considered as candidates for participation in cardiac rehabilitation.

References

1. Fsam VD, Somers R, Beck-Couzijh Van AL. Quality of life: some theoretical issues. *J Clin. Pharmacol.* 1981; 21 suppl 8-9:165-168
2. Kinney MR, Packa DR. Measuring the unmeasurable: Quality of life. *Cardiovasc Nurs* 1988; 24:52-53
3. Stanley H. Taylor: Drug therapy and quality of life in angina pectoris. *Am Heart J* 1987; 3:234-240
4. The World Health Report 1998. World Health Organization, Geneva, 1998
5. Long-term comprehensive care of cardiac patients. Task Force of the working group on cardiac rehabilitation of the European Society of Cardiology. *European Heart Journal* 1991; 13:1-45
6. Franklin BA, Gordon S, Timmis GC. Amount of exercise necessary for the patient with coronary artery disease. *American Journal of Cardiology* 1992; 69:1426-1432
7. Oldridge N, Guyatt G, Jones N, et al. Effects on quality of life with cardiac rehabilitation after acute myocardial infarction. *American Journal of Cardiology* 1991; 67:1084-1089
8. Oldridge NB, Gottlieb M, Guyatt G, Jones NL, Feeny D, Streiner D. Predictors of health-related quality of life with cardiac rehabilitation after acute myocardial infarction. *Journal of Cardiopulmonary Rehabilitation*, 1998; 18:95-103
9. Coats A, McGee HM, Stokes H, Thompson DR (Eds). *British Association for Cardiac Rehabilitation. Guidelines for Cardiac Rehabilitation.* Oxford: Blackwell, 1995
10. Desmond G. Julian: Quality of life after myocardial infarction. *Am Heart J* 1987; 3: 241-244
11. Chambers LW., McDonald L.A., Tugwell P., Buchanan W.W., Kroap G. The Mac Master Health Index questionnaire as a measure of the quality of life for patients with rheumatoid disease. *J Pharmacol* 1982; 9: 780-784
12. Ergner M, Bobbiti RA, Carter WB, Gilson BS. The Sickness Impact Profile. Developments and final revision of a health status measure. *Med Care*, 1981; 19:787-805
13. Velasco JA. Del Bario MV, Mestre MV, Penas C, Ridocci F. Assessment of Quality of Life in Myocardial Infarction Patients, in Proceedings of the 5th World Congress on Cardiac Rehabilitation Bordeaux, France, July 5-8, 1992
14. Rector TS, Kubo SH, Cohn JN. Patient's self-assessment of their congestive heart failure. Part 2. Content reliability and validity of a new measure, the Minnesota living with heart failure questionnaire. *Heart failure* 1993; 3:198-209
15. Ware J, Sherbourne CD. The MOS 36-item short form health survey (SF - 36). I. Conceptual framework and item selection. *Med Care* 1992; 30:473-483
16. McHorney CA, Ware J, Raczek AE. The MOS 36-item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Med Care* 1993; 31:247-263
17. Failde I, Ramos I. Validity and reliability of the SF-36 Health Survey Questionnaire in patients with coronary artery disease. *Eur J Epidemi* 2000; 53:311-316
18. Kiebazk GM, Person LM, Campbell M, Cook JW. Use of the SF-36 general health status survey to document health-related quality of life in patients with coronary artery disease: effect of disease and response in coronary artery bypass graft surgery. *Heart Lung* 2002; 31:207-210
19. Oldridge NB. Effects on quality of life with comprehensive rehabilitation after acute myocardial infarction. *Am J Cardiol* 1991; 67:1084-1089
20. Ebbesen L, McCartney N, Guyatt E, Oldridge NB. Measuring quality of life in cardiac patients. *J Clin Epidemiol* 1990; 43:481-487
21. Yate BC, Booton-Hiser DA. Comparison of psychologic stress responses in patients and spouses ten weeks after cardiac illness event. *Prog Cardiovasc Nur.* 1992;7:25-33
22. Ott CR, Sivarajan ES, Newton KM, et al. A controlled randomized study of early rehabilitation. *Heart Lung* 1983; 12:162-170
23. CASS: A randomized trial of coronary artery bypass surgery. Quality of life in patients randomly assigned to treatment groups. *Circulation* 1983; 68:951-960
24. Oldridge NB. Compliance with cardiac rehabilitation services. *J Cardiopulm Rehabil* 1991; 11:115-27
25. Wenger NK. Rehabilitation after cardiovascular diseases: report and recommendations of a World Health Organization expert Committee. *Int J Sports Cardiol* 1992; 1:101-103
26. Hajalmarson AC. Use of beta blockers in post infarct prophylaxis: Aspects on quality of life. *Am Heart J* 1987; 114:245
27. Scheidt S. Ischemic Heart Disease: A patient-specific therapeutic approach with emphasis on quality of life considerations. *Am Heart J* 1987; 3: 114:121

-
28. Wenger NK, Mattson ME, Furberg CD and Elinson L. Assessment of quality of life in clinical trials of cardiovascular therapies. *Am J of Card* 1984; 54:908
 29. Dempster M, Donnelly M. Measuring the health related quality of life of people with ischaemic heart disease. *Heart* 2000; 83:641-644
 30. Andjour A, Lauterbach KW. Review of quality-of-life evaluations in patients with angina pectoris. *Pharmacoeconomics* 1999; 16:141-152
 31. Berry C, Mc Murray J. A review of quality-of-life evaluations in patients with congestive heart failure. *Pharmacoeconomics* 1999; 16:247-271
 32. C Levy and R Milani . Effects of Cardiac Rehabilitation exercise Training on Weight Reduction, Exercise Capacity, Coronary Risk Factors, Behavioral Characteristics and Quality of Life in Obese Coronary Patients. *Am J Cardiol* 1997; 79:397-401
 33. Rumsfeld JS, Magid DJ, Plomondon ME, et al. History of depression, angina, and quality of life after acute coronary syndromes. *Am Heart J* 2003; 145:493-499